

CLAIMS

What is claimed is:

1. A radio frequency (RF) receiver comprising:

a local oscillator (LO) for generating a local oscillation signal;

first and a second mixers coupled to said LO, for converting a received RF signal to an in-phase intermediate frequency (IF) signal and a quadrature IF signal, respectively;

an LO frequency control module, coupled to said LO, for alternately down-converting a channel frequency by changing an oscillation frequency of said LO;

a down converter, coupled to said first and second mixers, for down converting said in-phase IF signal and said quadrature IF signal to a baseband; and

a down conversion controller, coupled to said down converter, for adjusting a complex sine wave within said down converter.

2. The RF receiver of Claim 1, wherein said LO frequency control module alternately down-converts a channel frequency on a frame-by-frame basis.

3. The RF receiver of Claim 2, wherein said LO frequency control module alternately down-converts a channel frequency by

$$\text{even frame: } f_{\text{RFLO}} = f_{\text{CH}} - f_{\text{IF}}$$

$$\text{odd frame: } f_{\text{RFLO}} = f_{\text{CH}} + f_{\text{IF}}$$

wherein f_{RFLO} = said local oscillation frequency

f_{CH} = said channel frequency

f_{IF} = said IF signal frequency

4. The RF receiver of Claim 3, wherein said down conversion controller adjusts a complex sine wave $e^{\pm j\omega t}$ within said down converter by

$$\text{even frame: } IFLO(t) = e^{-j\omega_{\text{IF}}t}$$

$$\text{odd frame: } IFLO(t) = e^{+j\omega_{\text{IF}}t}$$

$$\text{where } e^{-j\omega_{\text{IF}}t} = \text{Cos}\omega_{\text{IF}}t - j\text{Sin}\omega_{\text{IF}}t$$

$$e^{+j\omega_{\text{IF}}t} = \text{Cos}\omega_{\text{IF}}t + j\text{Sin}\omega_{\text{IF}}t$$

$$\omega_{\text{IF}} = 2\pi f_{\text{IF}}$$

5. The RF receiver of Claim 4, wherein said frames are time-division multiple access (TDMA) frames.

1 6. The RF receiver of Claim 3, wherein said down conversion controller adjusts a
2 complex sine wave $e^{\pm j\omega t}$ within said down converter by

$$\begin{aligned} \text{even frame: } IFLO(t) &= e^{+j\omega_{IF}t} \\ \text{odd frame: } IFLO(t) &= e^{-j\omega_{IF}t} \end{aligned}$$

$$\begin{aligned} \text{where } e^{-j\omega_{IF}t} &= \cos\omega_{IF}t - j\sin\omega_{IF}t \\ e^{+j\omega_{IF}t} &= \cos\omega_{IF}t + j\sin\omega_{IF}t \\ \omega_{IF} &= 2\pi f_{IF} \end{aligned}$$

1 7. The RF receiver of Claim 6, wherein said frames are time-division multiple access
2 (TDMA) frames.

1 9. The RF receiver of Claim 2, wherein said LO frequency control module alternately
2 down-converts a channel frequency by

$$\text{even frame: } f_{\text{RFLO}} = f_{\text{CH}} + f_{\text{IF}}$$

$$\text{odd frame: } f_{\text{RFLO}} = f_{\text{CH}} - f_{\text{IF}}$$

$$\begin{aligned} \text{wherein } f_{\text{RFLO}} &= \text{said local oscillation frequency} \\ f_{\text{CH}} &= \text{said channel frequency} \\ f_{\text{IF}} &= \text{said IF signal frequency} \end{aligned}$$

1 9. The RF receiver of Claim 8, wherein said down conversion controller adjusts a
2 complex sine wave $e^{\pm j\omega t}$ within said down converter by

$$\begin{aligned} \text{even frame: } IFLO(t) &= e^{+j\omega_{IF}t} \\ \text{odd frame: } IFLO(t) &= e^{-j\omega_{IF}t} \end{aligned}$$

$$\begin{aligned} \text{where } e^{-j\omega_{IF}t} &= \cos\omega_{IF}t - j\sin\omega_{IF}t \\ e^{+j\omega_{IF}t} &= \cos\omega_{IF}t + j\sin\omega_{IF}t \\ \omega_{IF} &= 2\pi f_{IF} \end{aligned}$$

1 10. The RF receiver of Claim 9, wherein said frames are time-division multiple access
2 (TDMA) frames.

1 11. The RF receiver of Claim 8, wherein said down conversion controller adjusts a
2 complex sine wave $e^{\pm j\omega t}$ within said down converter by

$$\begin{aligned} \text{even frame: } IFLO(t) &= e^{-j\omega_{IF}t} \\ \text{odd frame: } IFLO(t) &= e^{+j\omega_{IF}t} \end{aligned}$$

$$\begin{aligned} \text{where } e^{-j\omega_{IF}t} &= \cos\omega_{IF}t - j\sin\omega_{IF}t \\ e^{+j\omega_{IF}t} &= \cos\omega_{IF}t + j\sin\omega_{IF}t \\ \omega_{IF} &= 2\pi f_{IF} \end{aligned}$$

1 12. The RF receiver of Claim 11, wherein said frames are time-division multiple access
2 (TDMA) frames.

1 13. The RF receiver of Claim 1, wherein said RF receiver further includes an IF filter.

1 14. The RF receiver of Claim 1, wherein said RF receiver further includes an analog-to-
2 digital converter.

1 15. A method for enhancing signal quality within a radio frequency (RF) receiver, said
2 method comprising:

3 receiving a RF signal;

4 alternately down-converting a channel frequency by changing a local
5 oscillation frequency, wherein said local oscillation frequency is utilized for
6 converting said received RF signal to an in-phase intermediate frequency (IF) signal
7 and a quadrature IF signal; and

8 adjusting a complex sine wave when down converting said in-phase IF signal
9 and said quadrature IF signal to a baseband signal.

1 16. The method of Claim 15, wherein said alternately down-converting further includes
2 alternately down-converting said in-phase IF signal and said quadrature IF signal on a
3 frame-by-frame basis.

1 17. The method of Claim 16, wherein said alternately down-converting is performed by

2 even frame: $f_{\text{RFLO}} = f_{\text{CH}} - f_{\text{IF}}$

3 odd frame: $f_{\text{RFLO}} = f_{\text{CH}} + f_{\text{IF}}$

4 wherein f_{RFLO} = said local oscillation frequency

5 f_{CH} = said channel frequency

6 f_{IF} = said IF signal frequency

1 18. The method of Claim 17, wherein said adjusting further includes adjusting a
2 complex sine wave $e^{\pm j\omega t}$ by

$$\text{even frame: } IFLO(t) = e^{-j\omega_{\text{IF}}t}$$

$$\text{odd frame: } IFLO(t) = e^{+j\omega_{\text{IF}}t}$$

$$\text{where } e^{-j\omega_{\text{IF}}t} = \cos\omega_{\text{IF}}t - j\sin\omega_{\text{IF}}t$$

$$e^{+j\omega_{\text{IF}}t} = \cos\omega_{\text{IF}}t + j\sin\omega_{\text{IF}}t$$

$$\omega_{\text{IF}} = 2\pi f_{\text{IF}}$$

1 19. The method of Claim 18, wherein said frames are time-division multiple access
2 (TDMA) frames.

1 20. The method of Claim 17, wherein said adjusting further includes adjusting a
 2 complex sine wave $e^{\pm j\omega t}$ by

$$\begin{aligned} \text{even frame: } IFLO(t) &= e^{+j\omega_{IF}t} \\ \text{odd frame: } IFLO(t) &= e^{-j\omega_{IF}t} \end{aligned}$$

$$\begin{aligned} \text{where } e^{-j\omega_{IF}t} &= \cos\omega_{IF}t - j\sin\omega_{IF}t \\ e^{+j\omega_{IF}t} &= \cos\omega_{IF}t + j\sin\omega_{IF}t \\ \omega_{IF} &= 2\pi f_{IF} \end{aligned}$$

1 21. The method of Claim 20, wherein said frames are time-division multiple access
 2 (TDMA) frames.

1 22. The method of Claim 17, wherein said alternately down-converting is performed by

$$\text{even frame: } f_{\text{RFLO}} = f_{\text{CH}} + f_{\text{IF}}$$

$$\text{odd frame: } f_{\text{RFLO}} = f_{\text{CH}} - f_{\text{IF}}$$

$$\text{wherein } f_{\text{RFLO}} = \text{said local oscillation frequency}$$

$$f_{\text{CH}} = \text{said channel frequency}$$

$$f_{\text{IF}} = \text{said IF signal frequency}$$

1 23. The method of Claim 22, wherein said adjusting further includes adjusting a
2 complex sine wave $e^{\pm j\omega t}$ by

$$\begin{aligned} \text{even frame: } IFLO(t) &= e^{+j\omega_{IF}t} \\ \text{odd frame: } IFLO(t) &= e^{-j\omega_{IF}t} \end{aligned}$$

$$\begin{aligned} \text{where } e^{-j\omega_{IF}t} &= \cos\omega_{IF}t - j\sin\omega_{IF}t \\ e^{+j\omega_{IF}t} &= \cos\omega_{IF}t + j\sin\omega_{IF}t \\ \omega_{IF} &= 2\pi f_{IF} \end{aligned}$$

1 24. The method of Claim 23, wherein said frames are time-division multiple access
2 (TDMA) frames.

1 25. The method of Claim 22, wherein said adjusting further includes adjusting a
2 complex sine wave $e^{\pm j\omega t}$ by

$$\begin{aligned} \text{even frame: } IFLO(t) &= e^{-j\omega_{IF}t} \\ \text{odd frame: } IFLO(t) &= e^{+j\omega_{IF}t} \end{aligned}$$

$$\begin{aligned} \text{where } e^{-j\omega_{IF}t} &= \cos\omega_{IF}t - j\sin\omega_{IF}t \\ e^{+j\omega_{IF}t} &= \cos\omega_{IF}t + j\sin\omega_{IF}t \\ \omega_{IF} &= 2\pi f_{IF} \end{aligned}$$

1 26. The method of Claim 25, wherein said frames are time-division multiple access
2 (TDMA) frames.

1 27. A radio frequency (RF) receiver comprising:

2 a local oscillator (LO) for generating a local oscillation signal;

3 first and second mixers coupled to said LO, for converting a received RF
4 signal to an in-phase intermediate frequency (IF) signal and a quadrature IF signal,
5 respectively;

6 an LO frequency control module, coupled to said LO, for alternately down-
7 converting a channel frequency by changing an oscillation frequency of said LO;

8 a switch, coupled to said first and second mixers, for alternately swapping
9 signals paths of said in-phase IF signal and said quadrature IF signal in
10 synchronization with an oscillation frequency of said LO; and

11 a down converter, coupled to said switch, for down converting said in-phase
12 IF signal and said quadrature IF signal to a baseband signal.

1 28. The RF receiver of Claim 27, wherein said LO frequency control module alternately
2 down-converts a channel frequency on a frame-by-frame basis.

1 29. The RF receiver of Claim 28, wherein said LO frequency control module alternately
2 down-converts a channel frequency by

3 even frame: $f_{\text{RFLO}} = f_{\text{CH}} - f_{\text{IF}}$

4 odd frame: $f_{\text{RFLO}} = f_{\text{CH}} + f_{\text{IF}}$

5 *wherein* f_{RFLO} = said local oscillation frequency

6 f_{CH} = said channel frequency

7 f_{IF} = said IF signal frequency

1 30. The RF receiver of Claim 29, wherein said frames are time-division multiple access
2 (TDMA) frames.

1 31. The RF receiver of Claim 28, wherein said LO frequency control module alternately
2 down-converts a channel frequency by

3 even frame: $f_{\text{RFLO}} = f_{\text{CH}} + f_{\text{IF}}$

4 odd frame: $f_{\text{RFLO}} = f_{\text{CH}} - f_{\text{IF}}$

5 *wherein* f_{RFLO} = said local oscillation frequency

6 f_{CH} = said channel frequency

7 f_{IF} = said IF signal frequency

1 32. The RF receiver of Claim 31, wherein said frames are time-division multiple access
2 (TDMA) frames.

1 33. The RF receiver of Claim 27, wherein said RF receiver further includes an IF filter.

1 34. The RF receiver of Claim 27, wherein said RF receiver further includes an analog-
2 to-digital converter.

1 35. A method for enhancing signal quality within a radio frequency (RF) receiver, said
2 method comprising:

3 receiving a RF signal;

4 alternately down-converting a channel frequency by changing a local
5 oscillation frequency, wherein said local oscillation frequency is utilized for
6 converting said received RF signal to an in-phase intermediate frequency (IF) signal
7 and a quadrature IF signal;

8 alternately swapping signals paths of said in-phase IF signal and said
9 quadrature IF signal in synchronization with said local oscillation frequency; and

10 down converting said in-phase IF signal and said quadrature IF signal to a
11 baseband.

1 36. The method of Claim 35, wherein said alternately down-converting further includes
2 alternately down-converting said in-phase IF signal and said quadrature IF signal on a
3 frame-by-frame basis.

1 37. The method of Claim 36, wherein said alternately down-converting is performed by

2 even frame: $f_{\text{RFLO}} = f_{\text{CH}} - f_{\text{IF}}$

3 odd frame: $f_{\text{RFLO}} = f_{\text{CH}} + f_{\text{IF}}$

4 *wherein* f_{RFLO} = said local oscillation frequency

5 f_{CH} = said channel frequency

6 f_{IF} = said IF signal frequency

1 38. The method of Claim 38, wherein said frames are time-division multiple access
2 (TDMA) frames.

1 39. The method of Claim 37, wherein said alternately down-converting is performed by

2 even frame: $f_{\text{RFLO}} = f_{\text{CH}} + f_{\text{IF}}$

3 odd frame: $f_{\text{RFLO}} = f_{\text{CH}} - f_{\text{IF}}$

4 *wherein* f_{RFLO} = said local oscillation frequency

5 f_{CH} = said channel frequency

6 f_{IF} = said IF signal frequency

1 40. The method of Claim 39, wherein said frames are time-division multiple access
2 (TDMA) frames.